

II. CLAIMS

1. An apparatus for confidential viewing of a fundamental image utilizing spatial multiplexing image modification, comprising:
- 5 (a) an image display device comprising a plurality of adjacent display regions of different polarization states.
- (b) a plurality of spatially multiplexed fundamental image components and masking image components being displayed on said image display device in association with said display regions and in such arrangement as to render said fundamental image components substantially indecipherable to the
- 10 naked eye;
- (c) said fundamental image components being representative of a fundamental image and being associated with said display regions having a common state of polarization that is different than the state of polarization of said display regions with which said masking image components are associated;
- 15 and
- (d) an image viewing device having polarization means cooperating with said image display device for allowing extraction and viewing only of said fundamental image components from said image display device.
- 20 2. The confidential viewing apparatus of claim 1, wherein at least some of said masking image components are derived from said fundamental image components displayed therewith.
3. The confidential viewing apparatus of claim 1, wherein at least some of said
- 25 masking image components are the derived inverse of corresponding said

~~PCT/US05/10807~~

fundamental image components displayed therewith, and the display of said fundamental and masking image components on said image display device generates a combined neutral image that appears substantially featureless to the naked eye.

5

4. The confidential viewing apparatus of claim 3, including overlay image components displayed in association with said masking image components such that an overlay image appears to the naked eye as being overlaid upon said substantially featureless image.

10

5. The confidential viewing apparatus of claim 1 or 3, wherein the display of said fundamental image components and said masking image components on said image display device are positionally alternated in time.

15

6. The confidential viewing apparatus of claim 1, wherein said fundamental image components are positionally altered in time to associate with separate sets of said display regions having differing polarization states.

20

7. The confidential viewing apparatus of claim 1, wherein at least said fundamental image components are time multiplexed with derived inverse image components thereof.

25

8. The confidential viewing apparatus of claim 1, wherein both said fundamental image components and said masking image components are time multiplexed with derived inverse image components thereof.

9. The confidential viewing apparatus of claim 8, wherein each of said masking image components is the derived inverse of a corresponding fundamental image component associated with the same said display region.
- 5
10. The confidential viewing apparatus of claim 1, wherein said polarization states of said display regions are fixed.
11. The confidential viewing apparatus of claim 1, wherein said polarization states of said display regions are variable.
- 10
12. The confidential viewing apparatus of claim 11, wherein each of said display regions include a variable polarizer capable of altering the state of polarization thereof.
- 15
13. The confidential viewing apparatus of claim 12, wherein said variable polarizer is comprised of an electrically-controlled liquid crystal device.
14. The confidential viewing apparatus of claim 1, wherein said different polarization states of said display regions are generally orthogonal to one another.
- 20
15. The confidential viewing apparatus of claim 1, wherein at least some of said display regions are left-hand circularly polarized and at least some of said display regions are right-hand circularly polarized.
- 25

~~PCT/US2005/10807~~

16. The confidential viewing apparatus of claim 1, wherein said display regions with which said fundamental image components are associated are cross-polarized relative to said display regions with which said masking image components are associated.

5

17. The confidential viewing apparatus of claim 1, wherein said image display device is an electronic display device comprising a plurality of display pixels and having a periodic display refresh cycle, and wherein each of said display regions includes at least one of said pixels of said electronic display device.

10

18. The confidential viewing apparatus of claim 17, wherein said electronic display device includes a transparent overlay with designated separate areas of cross-polarized orientations that align with said pixels to form said plurality of differently polarized display regions.

15

19. The confidential viewing apparatus of claim 17, wherein said fundamental image components and said masking image components are regenerated upon each said display refresh cycle in association with a separate set of said pixels having a different polarization state than that of the next previous said display cycle of said electronic display device.

20

20. The confidential viewing apparatus of claim 19, wherein said image viewing device is comprised of active polarized eyewear which communicates with said electronic display device to change states of polarization in sync with said display refresh cycle of said electronic display device.

25

21. The confidential viewing apparatus of claim 17, wherein said display regions of said electronic display device include a variable polarizing means for altering the state of polarization thereof, and said image viewing device is comprised of active polarized eyewear that communicates with said electronic display device to change states of polarization in sync with changes in the polarization state of said display regions.

22. An apparatus for confidential viewing of a fundamental image utilizing spatial multiplexing image modification, comprising:

- (a) an image display device comprising a plurality of adjacent display regions of different polarization states.
- (b) means for generating an image on said image display device having a fundamental image component and a corresponding inverse image component spatially arranged in association with said display regions so as to form a combined image that appears substantially featureless to the naked eye;
- (c) said image generating means and said image display device cooperatively communicating so that said fundamental image component is associated with at least one of said display regions having a polarization state different than that with which said inverse image component is associated; and
- (d) image viewing means cooperatively polarized with said display regions of said image display device for allowing viewing only of said fundamental image component of said combined substantially featureless image.

~~PCT/US2005/010807~~

23. The confidential viewing apparatus of claim 22, wherein said plurality of display regions are arranged in alternating columns of different polarization states.
24. The confidential viewing apparatus of claim 22, wherein said plurality of display regions are arranged in alternating rows of different polarization states.
25. The confidential viewing apparatus of claim 22, wherein said combined substantially featureless image is comprised of a plurality of said fundamental image components and corresponding inverse image components associated with alternating sets of said adjacent display regions having different polarization states.
26. The confidential viewing apparatus of claim 22, wherein said different polarization states of said display regions are generally orthogonal to one another.
27. The confidential viewing apparatus of claim 22, wherein at least some of said display regions are left-hand circularly polarized and at least some of said display regions are right-hand circularly polarized.
28. The confidential viewing apparatus of claim 22, wherein said plurality of display regions have fixed polarization states.
29. The confidential viewing apparatus of claim 22, wherein said plurality of display regions have variable polarization states.
30. The confidential viewing apparatus of claim 29, wherein each of said display

~~PCT/US2005/10807~~
regions comprise an electrically variable polarizer.

31. The confidential viewing apparatus of claim 30, wherein said variable polarizer comprises a liquid crystal device capable of altering polarization state.

5

32. The confidential viewing apparatus of claim 22, wherein said image display device constitutes an electronic display device having a plurality of display pixels, each of said display regions comprising at least one of said pixels of said electronic display device.

10

33. The confidential viewing apparatus of claim 32, wherein said fundamental image component is associated with at least one of said pixels having a common polarization state, and said corresponding inverse image component is associated with at least one of said pixels having a different polarization state.

15

34. The confidential viewing apparatus of claim 32, wherein said electronic display device is configured as a liquid crystal display device, and each of said display regions includes an electrically controllable polarizer that is comprised of a liquid crystal device capable of altering polarization state based on applied voltage thereto.

20

35. The confidential viewing apparatus of claim 32, including means for generating an overlay image visible to the naked eye and appearing over said substantially featureless image on said electronic display device, said overlay image having an overlay image component which is associated with at least one of said display regions having a polarization state common to that with which said inverse image

25

36. The confidential viewing apparatus of claim 32, wherein said electronic display device includes a transparent polarizing overlay extending over said display pixels, said polarizing overlay being constructed and arranged to alter the polarization state of some of said display pixels to generate said plurality of display regions of different polarization states.
37. The confidential viewing apparatus of claim 22, wherein said image display device includes a transparent polarizing overlay constructed and arranged to generate said plurality of adjacent display regions of different polarization states.
38. The confidential viewing apparatus of claim 22, wherein said fundamental image component is regenerated anew over time in association with a different said display region.
39. The confidential viewing apparatus of claim 38, wherein said different display region has a polarization state different than that with which said fundamental image component was previously associated.
40. The confidential viewing apparatus of claim 38, wherein said corresponding fundamental and inverse image components switch associated display regions over time.
41. A method for confidential viewing of a fundamental image utilizing spatial

multiplexing image modification, comprising the steps of:

- 5
- (a) polarizing adjacently positioned display regions of an image display device with different states of polarization;
- (b) displaying spatially multiplexed fundamental image components of a fundamental image with corresponding inverse image components thereof on said image display device in such arrangement as to neutralize and render said fundamental image components substantially invisible to the naked eye, whereby said fundamental image components are associated with said display regions having a state of polarization different than that with which said inverse image components are associated; and
- 10
- (c) viewing said image display device through a polarized filtering means that communicates with said image display device and allows passage and viewing only of said fundamental image components of said fundamental image.
- 15

42. The method of confidential viewing set forth in claim 41, wherein said step of polarizing said adjacently positioned display regions of said image display device includes the use of at least one electrically variable polarizer capable of altering the state of polarization of at least one of said display regions relative to other said display regions.

20

43. The method of confidential viewing set forth in claim 42, wherein said step of polarizing said adjacently positioned display regions is carried out with at least one variable polarizer of liquid crystal construction capable of altering the state of polarization of at least one of said display regions relative to other said display

25

regions based on applied voltage to said variable polarizer.

- 5 44. The method of confidential viewing set forth in claim 41, wherein said step of polarizing said adjacently positioned display regions of said image display device includes positioning a polarizing device having separate areas of differently fixed polarization states in alignment with said display regions of said image display device.
- 10 45. The method of confidential viewing set forth in claim 44, wherein said step of displaying spatially multiplexed image components includes varying over time the polarization state of said display regions with which said fundamental image components are associated.
- 15 46. The method of confidential viewing set forth in claim 41, wherein said step of displaying spatially multiplexed image components includes periodically alternating said display positions of said fundamental image components and said corresponding inverse image components to appear at differently polarized sets of said display regions of said image display device.
- 20 47. The method of confidential viewing set forth in claim 41, wherein said step of polarizing adjacently positioned display regions of said image display device includes arranging said display regions to alternate spatially between two states of polarization which are generally orthogonal to one another.
- 25 48. The method of confidential viewing set forth in claim 41, wherein said step of

~~PCT/US05/10807~~

displaying spatially multiplexed image components includes displaying overlay image components representative of a separate overlay image on said image display device, whereby said overlay image components are associated with at least some of said display regions having a polarization state common to that with which said inverse image components are associated.

5

49. The method of confidential viewing set forth in claim 41, wherein said step of viewing said image display device utilizes passive polarized eyewear to allow passage and viewing only of said fundamental image components of said fundamental image.

10

50. The method of confidential viewing set forth in claim 41, wherein said step of viewing said image display device utilizes active polarized eyewear operating in sync with said image display device to allow passage and viewing only of said fundamental image components of said fundamental image.

15

51. The method of confidential viewing set forth in claim 41, wherein said step of polarizing adjacently positioned display regions with different states of polarization includes the use of right-hand and left-hand circular polarization.

20

52. The method of confidential viewing set forth in claim 41, wherein said step of displaying fundamental and corresponding inverse image components on said image display device generates a combined substantially featureless image to the naked eye.

25

53. The method of confidential viewing set forth in claim 41, including the step of
periodically exchanging the display position of said fundamental and corresponding
inverse image components, while coincidentally altering the polarization state of
said display regions associated therewith so as to maintain a common polarization
5 state over time for all said display regions associated with said fundamental image
components being displayed.

54. A method for confidential viewing of a fundamental image utilizing spatial
multiplexing image modification, comprising the steps of:
- 10 (a) positioning a transparent polarizing overlay over an image display device,
said overlay comprising a plurality of adjacently positioned polarizers
having different polarization states;
- (b) producing a compound image on said display device that is comprised of a
15 plurality of spatially multiplexed fundamental image components and
masking image components aligned with said polarizers of said overlay,
whereby said fundamental image components are representative of a
fundamental image and aligned with said polarizers having a common state
of polarization different from that with which said masking image
components are aligned; and
- 20 (c) viewing said compound image through said overlay utilizing a lens filter
polarized in such manner as to allow passage and viewing only of said
fundamental image components of said fundamental image.

55. The method of confidential viewing described in claim 54, including the step of
25 time multiplexing said fundamental and masking image components with derived

56. The method of confidential viewing described in claim 55, wherein said step of viewing said compound image utilizes an active lens filter capable of altering its state of polarization to match that of said fundamental image components.
- 5